**SOCIAL NETWORK MAPPING:**

**A NEW TOOL FOR THE LEADERSHIP TOOLBOX**

By

Elisabeth J. Strines, Colonel, USAF

8037 Washington Road

Alexandria, VA 22308

348-40-1641

A Research Report Submitted to the Faculty

In Partial Fulfillment of the Graduation Requirements

Air Force Fellow, The Senior Seminar

Department of State

April 2002

| | | |
|---|---|---|
| **Report Documentation Page** | | *Form Approved*<br>*OMB No. 0704-0188* |

Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.

| 1. REPORT DATE<br>**00 APR 2002** | 2. REPORT TYPE<br>**N/A** | 3. DATES COVERED<br>**-** | |
|---|---|---|---|
| 4. TITLE AND SUBTITLE<br>**Social Network Mapping: A New Tool For The Leadership Toolbox** | | 5a. CONTRACT NUMBER | |
| | | 5b. GRANT NUMBER | |
| | | 5c. PROGRAM ELEMENT NUMBER | |
| 6. AUTHOR(S) | | 5d. PROJECT NUMBER | |
| | | 5e. TASK NUMBER | |
| | | 5f. WORK UNIT NUMBER | |
| 7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)<br>**Air University Maxwell Air Force Base, Alabama** | | 8. PERFORMING ORGANIZATION REPORT NUMBER | |
| 9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) | | 10. SPONSOR/MONITOR'S ACRONYM(S) | |
| | | 11. SPONSOR/MONITOR'S REPORT NUMBER(S) | |
| 12. DISTRIBUTION/AVAILABILITY STATEMENT<br>**Approved for public release, distribution unlimited** | | | |
| 13. SUPPLEMENTARY NOTES | | | |
| 14. ABSTRACT | | | |
| 15. SUBJECT TERMS | | | |

| 16. SECURITY CLASSIFICATION OF: | | | 17. LIMITATION OF ABSTRACT<br>**UU** | 18. NUMBER OF PAGES<br>**33** | 19a. NAME OF RESPONSIBLE PERSON |
|---|---|---|---|---|---|
| a. REPORT<br>**unclassified** | b. ABSTRACT<br>**unclassified** | c. THIS PAGE<br>**unclassified** | | | |

**Standard Form 298 (Rev. 8-98)**
Prescribed by ANSI Std Z39-18

## CERTIFICATE

I have read and understand the Academic Integrity Section of the Student Guide.  I certify that I have not used another student's research work and that the creative process of researching, organizing, and writing this research report represents only my own work.

_____

**DISCLAIMER**

The views expressed in this academic research paper are those of the author and do not reflect the official policy or position of the US government or the Department of Defense. In accordance with Air Force Instruction 51-303, it is not copyrighted, but is the property of the United States government.

**Table of Content**

| Contents | Page |
|---|---|

# Illustrations

Page

**Executive Summary**

This paper describes the concept of social network mapping and demonstrates how it can be used by squadron commanders and leaders at all levels to provide subtle insights into their organizations as well as their personnel, which can then be used to make more informed leadership and management decisions. Among other applications, the information provided by network mapping can be used to facilitate the identification of mentors, leaders, and "power-hoarders"; to examine workload and workflow; to reengineer workspace; and, perhaps most importantly, to improve the communication flow intra-and inter-unit.

Total quality management, a managerial approach adopted by the Air Force from the business world over a decade ago, is briefly examined to identify the benefits of such an effort as well as the lessons learned. The argument is made that there is much value in seeking out new approaches in a constantly changing world, with certain cautionary notes.

Mapping social (or informal) networks is a leading edge tool that can greatly assist commanders and other leaders in getting a good sight picture of the myriad communication lines in their organizations. Further, this mapping can be done with a minimum of time investment from individual workers, since the data is crunched by computers using scientifically based algorithms. Finally, the recommended use for this tool is on a commander-initiated basis, with information protected much as it is with the annual USAF Chief of Staff survey.

**The Challenge for Today's Commander**

Every new commander dreams of inheriting an organization with tiered and capable leadership working together like a well-oiled machine in support of mission objectives. The more likely scenario, however, is that the reality doesn't quite match the vision. While it is probable that the assigned mission is being accomplished and people are working hard and overcoming various obstacles to make it happen, the going is probably rough and morale not what it could be. With a continued deficit of mid-level experience, supervisors and trainers are stretched to the breaking point, and apprentice-level airmen are expected to do much of their learning on their own. Meanwhile, the operations tempo is up (and had been well before September 11th) and parts availability and equipment are often less than adequate. It's no wonder that organizations aren't just gliding along and that the morale of many is in the dregs. When separating airmen are queried as to why they are choosing to leave the force instead of making it a career, the fourth-cited reason is "leadership at the unit level."[1] While it is understandable that airmen are and have been leaving for civilian job opportunities and higher paychecks, it is extremely discouraging that leadership—or, more specifically, the lack thereof— is also a strong reason to leave instead of a compelling reason to stay. What are we doing wrong? What can we do better? How is a commander to guide his unit through the current maelstrom of challenges and lead his unit to organizational effectiveness nirvana complete with good morale and people who want to be there?

Besides being credible leaders in their own rights, one obvious answer is that commanders need to assemble all available resources in their pursuit of organizational excellence. They must identify and co-opt the leaders at all levels within their units as well as those with the potential to lead, to build the unit cohesion needed to effectively meet extremely

demanding mission requirements.  However, this is easier said than done, especially in larger

units.  While certain squadron members are bound to stand out by virtue of their obvious

credibility, leadership skills, and position, there are also informal leaders who quietly operate

behind the scenes, with talents that are not being fully leveraged.  Supervisors only two or three

levels up the chain may be quite unaware of the influence these "hidden" leaders project on their

peers and subordinates.  Then there are others with as yet untapped—perhaps even

unidentified—potential, but who could exercise positive influence on a measurable segment of

the workforce if placed in the right positions.  On the dark side, there are those who by virtue of

their positions and rank should be and appear to their seniors to be leaders, yet in reality fall far

short and are actually simply neutral space-holders or even disruptive to the unit, lacking

credibility with their subordinates.  And as much as commanders vow to get out and about and

gain first-hand knowledge of the individual capabilities of each of their troops, it's a rare

commander who meets his own expectations in this regard.  Therefore, even if we accept the

premise that the commander needs to put in place a multi-tiered team of leaders, we're still left

with the problem of how he's going to identify the right folks.  Further, if he does manage to

identify the folks he needs, he must figure out how to enact significant personnel moves—

because chances are, they are going to be some—without further disruption to the morale and

effectiveness of his unit, all while being the new guy on the block.  He doesn't have a lot of time,

either, since most command tours only last two years.  Of course, no one ever said it would be

easy....

**Tools for the Leadership Toolbox**

There is no doubt that the Air Force as an institution recognizes the critical relationship

of good leadership to effective mission accomplishment.  Not only are significant resources

devoted to the formal study of leaders and leadership methods in all levels of professional military education for both officers and enlisted personnel.  Additionally, the hunt is continuously on for new tools to add to the leader's toolbox, by watching for leadership and management developments in business and academia with the goal of identifying and tailoring relevant methodology to address our own leadership challenges—a "technology transfer" of sorts.   These applications are not undertaken lightly or on a whim, since we cannot afford to gamble with our combat edge.   Further, the timely and effective deployment of any new leadership and/or management methodology across the force requires resources beyond those already programmed for formalized education, so it's no small commitment to decide to include new approaches in our standardized tool kits.

The importance for caution notwithstanding, over the years we have indeed appropriated various business models and methods to improve our own organizational effectiveness and efficiency.  The most recent example of this cross-pollination was total quality management, or TQM, based on groundbreaking work by Dr W. Edwards Deming, a trained mathematician/physicist ultimately turned sociologist.  Dr Deming developed an empirically based methodology to transform industrial organizations by improving their production processes.  In addition to promoting the application of statistical process control at critical points along the way as opposed to inspections at the end of the production line, Dr Deming's "14 Points" outlined desirable manager/worker behaviors to engage all employees and make each one actively responsible for optimizing product quality.  When the application of his methodology put Japanese industry back on its feet following World War II—and far ahead of the competition—US businesses studied and applied Deming's methods as they struggled to catch up with the Japanese.  The US Navy then followed the lead of industry and applied

Deming's concepts to their aviation maintenance depots, with the Air Force following shortly thereafter by instituting much of the Deming philosophy in its own production line-oriented organizations. After the Secretary of Defense mandated in August 1988 that all military services would implement TQM,[2] the Air Force launched a major effort to implement TQM through all of its commands. Unfortunately, however, instead of being presented as a set of helpful tools and practices for leaders to integrate into their daily processes, TQM was deployed as "one more" mandatory program with separate reporting and inspection requirements and no additional resources. In fact, it ate up already limited resources as new offices were stood up to handle the increased measuring and reporting requirements and to prepare for a new and generally ill-defined inspection, the "quality inspection." Further, while training was provided to some degree, most airmen never gained even a layman's understanding of statistical process control methods, nor did that portion of Deming's methodology transfer easily to non-production line organizations. Instead, great frustration grew out of the TQM mandate, and the mere mention of those particular letters in that particular order is almost guaranteed even today to elicit groans of pain from airmen who "survived" TQM. Still, although the program itself has faded from official Air Force philosophy, at least three key concepts became part of our Air Force culture and are accepted and employed even by those who have no idea of their TQM origins:

the importance of identifying the customer(s) and their associated requirements in order to meet their needs,

the value of relevant and measurable metrics to support trends analysis and identification of system aberrations, and

the utility of worker-level problem-solving teams to capitalize on their knowledge in creating practical solutions and to facilitate buy-in.

**Why Do We Have to Change at All?**

Valuable lessons were learned from the "technology transfer" of TQM from the business world to the Air Force, but were the gains were worth the pain? Given the difficulties and resources required to introduce any substantially different approach, why can't we simply stick with our traditional leadership and management methods?

In a stationary world, we probably could keep doing things "the way we've always done them" and continue to obtain basic mission success. The fatal flaw in this concept, however, is obvious: the world is not stationary. When Frederick Taylor studied assembly lines and efficiencies thereof, it was his stated view that workers should be trained to accomplish tasks in one very specific and directed way to optimize the effectiveness of the line. In his own words, "Under our system a worker is told just what he is to do and how he is to do it. Any improvement he makes upon the orders given him is fatal to his success."[3] Initially, and for decades afterward, the concept of treating assembly line workers like automatons really worked pretty well—at least from the management's view, if not that of the workers. But as workers became more educated and "got out more," they became more and more dissatisfied with their one-dimensional treatment. Hence, the philosophy of Dr Deming—and others sharing the same school of thought that the worker should be respected and his inputs should be an integral part of the process—reaped almost immediate rewards when put to the test.

Before the introduction of TQM, the military workforce had undergone changes with which our leadership methodology had not kept pace. Education and experience levels of our enlisted force had soared, and we were certainly not consistently leveraging their expertise in solving problems. Further, the specialization and segregation of various career fields (e.g., flying

5

vice fixing aircraft) had resulted in some fairly serious rifts negatively impacting mission effectiveness. While as already mentioned there were some serious mistakes made in the actual deployment of TQM methods into the field, ultimately the concepts that lived beyond the "program" are utilized every day across the force to improve our overall mission effectiveness.

In the past decade, the speed of change has increased almost exponentially, even in the military. We are well past the stage of introducing computers to help handle the paperwork load with more efficiency than the now obsolete typewriter ever could, and the phenomenon of e-mail has enabled us to reach an unprecedented level of "real-time" communication. Simultaneously the boon and bane of commanders, e-mail enables them to be deluged with more written messages each day than could have ever been imagined in the past. It also enables them to reach out and touch every member of the squadron, albeit in a less personal manner than face-to-face. E-mail does **not**, however, help them in their quest to get out and about more, the old (and still highly touted and respected) "management by walking around" concept. In fact, e-mail can be another rope cinching a commander to his desk, if it's not handled with care and even cunning. By the nature of its very convenience, e-mail can actually encourage a commander not to leave his office at all, while still maintaining the semblance of connectivity with the rest of the squadron. In any case, e-mail is not going to help commanders in their search for internal leaders. Fortunately, there are other tools, both new and old, that can be of great assistance to our beleaguered grand poo-bahs.

**Sociology to the Rescue**

Sociologists, or social scientists, have spent more than a century and a half studying human interactions in a plethora of settings from families to tribes to, more recently, business

organizations. In the 20th century the use of empirical data was incorporated to support sociological findings, and the recent advent of computers has enabled sociologists to collect, sort, and analyze quantities of data on a scale that was unimaginable only a few decades ago. This new capability has enabled them to mathematically validate certain human relationship and communication patterns that previously could only have been hypothetically discussed or, at best, only assessed in very small sample sets. Consequently, sociologists have been making astronomical strides in several distinct disciplines, including social network analysis.

The idea that social ties could be visually displayed in a "network" was developed in the 1930s. Jacob Moreno invented the sociogram, which used points to represent people and lines to represent relationships between them. He then used the mapping of such relationships to identify apparent leaders as well as those out of the mix entirely, which he called "isolates". He also used his sociograms to determine indirect lines of connection, as in A knows B who knows C, so A and C are indirectly connected.[4]

Meanwhile, the observation that informal social ties within an organization were of notable importance was made following the famous Hawthorne plant experiment in which basic environmental factors such as lighting, heat, and rest period were varied to see how the changes affected worker productivity. As any basic management student knows, the surprising conclusion was that productivity went up regardless of the specific change made—whether the heat was raised or lowered, and so forth. The researchers concluded that it was the perception of management interest that caused productivity to increase—with the added attention, workers felt more valued, and therefore worked harder. After the conclusion of the Hawthorne experiment, the researchers continued to observe the workers and their work patterns, ultimately focusing on the relationships of the workers with each other. They discovered an "informal organization"

which seemed to exert significant influence on the workers' productivity apart from any managerial influence or company policy. Later, in the 60s and 70s, a mathematical dimension of social network analysis was developed by a group at Harvard led by Harrison White. This translation of specific social phenomena to numerical quantities enabled this "worker influence" phenomena to be measured and modeled.[5] Mark Granovetter, one of White's students, took the concept of social networks a step further when he researched how people got jobs. Ultimately, he determined that the far most effective way of getting jobs was through opportunities discovered by conversing with acquaintances as opposed to family members or close friends. From this unexpected discovery, he developed and documented a theory about how information diffuses through social networks in his seminal book on social network analysis, *Getting a Job*.[6]

Since its inception in the 1930s, the study of human behavior through the means of social network analysis has been "guided by formal theory organized in mathematical terms and grounded in the systematic analysis of empirical data."[7] Therefore, the field was artificially limited until the advances of the last few decades in graph theory and other related applied mathematics and the creation and availability of powerful computers. With those critical tools in hand, though, both the study and application of social network analysis have taken off. Prestigious management schools now offer post-graduate degrees specifically focused on social network analysis, and there are numerous trade journals and professional organizations focusing on recent developments and applications spanning fields from contagious disease research (e.g., AIDs) to organizational behavior to social support. Of most interest to us, of course, is the development of cutting-edge tools now available to help commanders as well as directors of large staffs in their quests for organizational excellence.

The existence and relative importance of informal leaders to any group or organization is certainly not a new concept—if somehow we had missed noting that phenomenon while growing up, we certainly encountered it in our first management or professional military education (PME) class.  The field of social network analysis has proven that there is a predictable pattern to these informal connections, however, and that

there are more roles to be played than strictly that of "leader". David Krakhardt, a leader in social network analysis, illustrated this pattern as a kite:
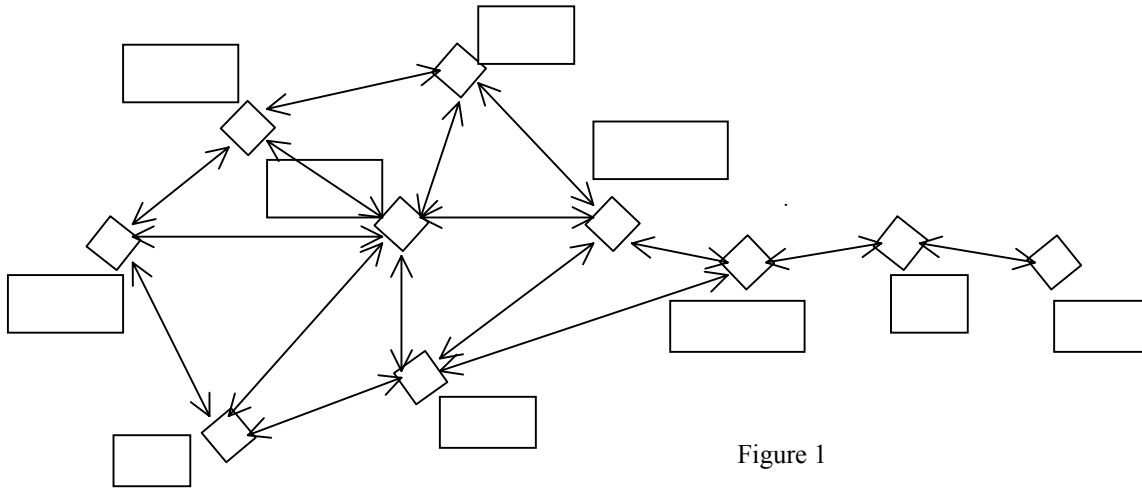


Figure 1

In this kite diagram, each diamond represents a person as noted by name, and each dual-arrowed line between diamonds indicates a reciprocal connection. (The length of each line is not indicative of anything except the artist's lack of talent—meaning mine, not Krakhardt's). Where there is no arrow, there is no relationship. It only takes a quick glance to see that not all participants are equally connected. Diane is clearly at the center of quite a bit of action, with six direct connections, or six degrees. On the other hand, these very connections and the extent to which they engage her attentions can actually result in isolating her, since she is only connected to others who are connected with each other. Heather has only three degrees, but her position is obviously critical since she's the only one that connects the rest of the group to the left with Ike to the right. Therefore, she is said to have high "betweenness," because she can broker information between the two groups. Or not. It's a pretty powerful position to be in. The third type of node of note is that occupied by both Fernando and Garth. Again, it is not as much how

many degrees they each have, which just happens to be five; instead, it is their relative proximity to each other member of the group. They don't have quite as many connections as Diane and they don't have the power position of Heather, but they are indirectly connected with each member of the group through the least number of collective nodes. Reasonably enough, their nodes are defined in terms of high "closeness." They are in the best position to monitor information passing through this illustrated network, since they can gather it directly as well as indirectly in the least amount of distance.[8]

Dr Karen Stephenson, a chemist/anthropologist leading the way in developing business applications for social network analysis, would call Diane a "hub," Heather a "gatekeeper," and Fernando and Garth "pulse-takers." Further, she would suggest that these individuals occupy these nodes because of the "deep-seated trust"—not necessarily associated with employment longevity—they've built with the other members of the organization.[9] She further suggests that those in the formal organizational hierarchy have no idea of the ground-level influence these particular members have with other employees. However, if managers were able to identify these network node occupants (who are sometimes unaware themselves of the crucial communications roles they are assuming), they could use this knowledge to the company's advantage. If, for example, one decided to put together a high performance team (in TQM jargon, a "process action team") to develop solutions to a critical problem, it would be extremely helpful to have at least one Diane, Heather, and Fernando or Garth on the team. The Diane would naturally turn to her fairly extensive clique for ideas as well as report back to them on the effort; the Heather would extend the idea search and progress reporting to a wider audience; and the Fernando/Garth would be a superb monitor to check in with later to see if the solution, after implementation, was working as anticipated. Most importantly, the solution would have

maximum input without an unwieldy-sized team, perforce enabling the best possible solution, and the worker-level buy-in would also be maximized.

The kite diagram represents a network that is just large enough to demonstrate each of the three types of critical nodes—the hub, gatekeeper, and pulse-taker (HGP). In a typical organization, there will be numerous examples of each of these types of nodes—generally, the larger the organization, the greater the number of the HGP nodes. Of course, some organizations are better interconnected than others, and that will also be readily visible by "maps" of the social networks—hereafter referred to as the "informal networks." An organization of reasonable size with very few centralizing nodes is at risk if one of those critical nodes should fail—if the incumbent changes jobs, becomes ill, and so forth. Therefore, as a general rule, it is better to have more HGP nodes and less centralization in the social network, first for the stability of the organization, but also because the risk of bottlenecking or worse is much greater if there are only a few key nodes.

### Hierarchies, Anyone?

So where are hierarchies in all this networking stuff? Isn't a hierarchy a type of network with its own sort of nodes? A hierarchy **is** in fact a type of network structure, with nodes designed right in at every level. The difficulty with depending strictly on hierarchies is that they don't work exactly as advertised. That is not to say that they don't work. But there is no question that a strict application of the rules of hierarchy will ensure slowness, if not the pace of glacial drift, as well as certain inefficiencies. Therefore, different lines of communication and dependence are bound to develop which are separate and different from the hierarchical lines. For example, let's look at the following hierarchy in an Air Force aircraft maintenance squadron.
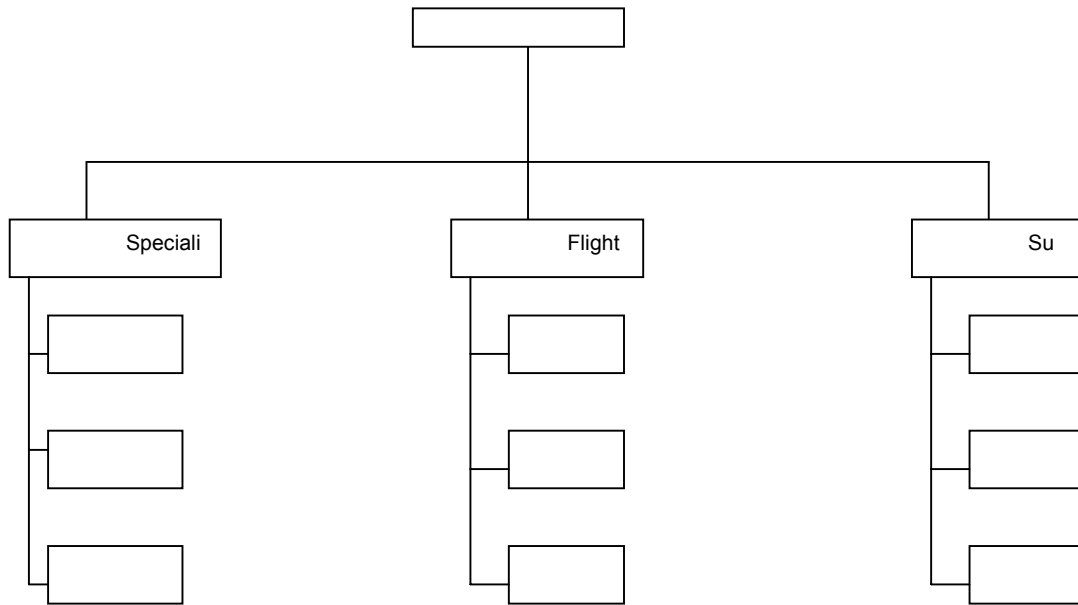
12

Figure 2

For Flight B to resolve an issue with Flight E, the accepted route to resolve it within the rules of the formal hierarchical structure is for Flight B to take it up through the specialist chief who will take it over to the flightline chief.  In turn, the flightline chief will obtain more information from Flight E, and then get back with the specialist chief, who will pass the information to Flight B.  Obviously, the resolution of a single issue could take several iterations of up, down, and back again—not exactly an efficient or effective way of doing things.  Hence, unless the chiefs insist that all issues go through them, informal networks are bound to spring up and cut across the hierarchical structure because that's the most efficient way to get things done. This is quite natural and should be encouraged, since it improves organizational effectiveness in two ways:  Flight B and Flight E should be able to resolve their issue more efficiently, and meanwhile the specialist and flightline chiefs can be working other issues.  Of course, the presence of the hierarchy still provides a route to solve the issue should the two flights not be able to agree to a solution.  On the other hand, if the hierarchy is ineffective in solving problems

13

when they are raised "up the chain" or if the members in the formal hierarchy are viewed as adding no value to the process, the informal networks will ultimately overwhelm the hierarchy or at least parts thereof.

The vast majority of organizations have both hierarchies and networks. While the hierarchical structure is obvious to anyone who can read an organizational chart, many informal networks operate below the surface and are often invisible to the hierarchy as well as to actual members in the networks. Hierarchies and networks have different attributes and therefore different advantages and disadvantages. For example, hierarchies are based on assigned authority and tend to be heterogeneous (not everyone looks or sounds the same), rigid, and slow to react. Networks are based on trust and tend to be homogeneous, flexible, and rapid to react.[10] Just like hierarchies, however, even networks can become ossified if they're not stirred up a little—witness the "old boy" networks that, while not part of a formal hierarchy, can be exclusionary and inflexible.

Networks can ultimately overcome hierarchies by putting them on disregard, but hierarchies can also squash networks by moving the people occupying critical nodal positions (either purposefully or accidently). Neither situation is desirable, however, because the complementary strengths of both the hierarchical structure and informal networks can be leveraged to improve the effectiveness of an organization.


**Mapping Informal Networks**

With the mathematical algorithms and high-powered computers available today, mapping various types of informal networks is not as difficult as it might sound. Data is collected from sets of only 6-10 tailored questions answered by each member of the organization being mapped.

14

The questions can be designed to focus on different types of relationships including work connections, social connections outside of work, or mentoring. Once this data is collected, it's plugged into computer programs that first scrub the data—for example, if person A says he constantly gives advice to person B, the software double checks the input from B, to validate A's claim. If a relationship is claimed by only one of the declared two participants, most software would not chart that as a relationship. Next, the validated connections are mapped out in a network "map," visibly showing the connections that exist in the organization being analyzed. Depending on the sample size, the map might simply show lines, with each line representing a relationship between two unnamed people, or it might get down to the level that one can identify the actual people themselves. Both views serve distinct purposes. The macro view can be extremely helpful in examining the communication lines (or lack thereof) between divisions or shops or flights. More than one company has discovered that their marketing and engineering divisions were working almost in isolation from each other, thereby solving the mystery of why they were experiencing difficulties in selling newly developed products. The micro-level look can provide sometimes completely unexpected insights into who's doing what. For example, one might discover a non-managerial line-worker relied on by managers and workers alike for advice in resolving various work challenges. Conversely, others might be uncovered that, while giving the appearance to their bosses of being very connected and trusted by their subordinates, are rarely sought out by few if any subordinates for assistance or advice.

### Can This Really Be a Tool for the Military?

As a previous commander of a 700-person squadron, I can see great utility in occasionally mapping the sub-surface networks in a military organization. Even someone in

charge of a 200-person unit can't possibly be aware of all the inner-workings of his organization, and with around-the-clock shifts, the task is that much more difficult.  It's relatively easy to know the first several layers of assigned leadership, but beyond that it rapidly gets harder. Deployments are always helpful in getting to observe first-hand a particular set of airmen from the most junior on up, but even that doesn't provide enough exposure either depth-wise or across the organization of all assigned personnel.

Network mapping isn't going to remove the challenge or the need to continually strive to personally know one's troops.  However, it can provide an instant and reasonably reliable picture of the various influences of different unit members in addition to drawing a general picture of the information flow within and external to the organization itself.  Alternatively, a commander could query his underlings for names of the most influential members under their supervision and on down the chain; besides being a pain in the neck to obtain, though, the results would by definition be skewed by the perceptions of the reporting supervisors.

### Practical Uses of Network Mapping

Unlike some other management tools and methodologies, network mapping is relatively simple to accomplish and the results can be put to immediate use.  For starters, network mapping provides the capability to accomplish the following actions:

**Identify individuals filling key communications node positions**:  By identifying the hubs, gatekeepers, and pulse-takers, one can dramatically improve the clarity of one's communications to the squadron at large.  Information is traditionally passed from the commander or director to the next level down, and so forth, but invariably there are folks at the middle or at the bottom who either don't get the message, or else get a jumbled message.  While

I wouldn't recommend ceasing the traditional method of information flow—since we are, after all, accustomed to working within a hierarchical framework, and with good reason—use of the hubs and gatekeepers as a second layer of information passing, albeit informal, would provide a second layer of opportunity to deploy an accurate message to the lower levels. For particularly important messages, this extra effort could be well worth it. Follow-up to clarify the accuracy and coverage of the deployed message, whether delivered by hubs and gatekeepers or by through traditional supervisory channels, could be done by querying the pulse-takers.

**Identify principal mentors**: By framing survey questions that ask who individuals turn to for career and personal advice, one can get a solid idea of how much mentoring is occurring in the unit and identify who is doing the mentoring. If the named supervisors have been in the squadron for a while, the relative quality of their mentoring can be surmised by examining the progress and retention of their mentees. It would also be of interest to observe which supervisory senior NCOs and field graders are named infrequently or not at all. If some are named with regularity while others are not, it would be reasonable to consider the reasons why— lack of opportunity, lack of engagement, lack of credibility, personal issues of their own, etc. Finally, who is mentoring whom would be of interest in terms of diversity. Is mentoring cutting across gender, race, and religion, or is it simply like mentoring like? If the latter is seen to be true, then opportunities are probably being lost as well as potentially inequitable.

**Identify the most effective and relied-upon trainers**: Our training program relies on qualified individuals providing on-the-job task training to less experienced members in their respective career fields. While it is intuitively obvious that not all trainers or trainees are equally gifted or motivated, we do not consistently do a good job of identifying those trainers who are especially effective in transforming trainees to qualified practitioners of their specialty. Not only

do these individuals deserve encouragement and recognition for what they're doing; chances are that they have certain techniques which they could pass on to others, thereby sharing the training burden and improving overall training effectiveness. It goes without saying (but I'll say it anyway!) that this, in turn, would increase mission effectiveness as well as morale, as more individuals became more competent in their duties in less time and weren't as reliant on the same few folks to answer their questions. Meanwhile, those with the top training skills could become at least somewhat freed up to apply more of their attention to task accomplishment as well as continuing to increase their own knowledge.

**Identify individuals being task-saturated by the needs of others**: Chances are good that within a unit there are a few good men and/or women that others turn to first for help—whether it's with a technical problem, help with writing, or advice on any number of issues. While it's great to have those standout members in any unit, they can also be so engaged in helping others when called upon that their own work suffers and required actions are being slowed down at their desks. Conversely, they could be trying to do it all and are therefore in fear of burnout without even knowing it. Identifying those people before they turn into toast (either from exhaustion or from boss frustration with their apparent bottlenecking) can enable analysis of the situation and work to be rerouted as needed, individuals steered to others for help, and so on.

**Identify those in key leadership positions not exercising the expected/desired influence**: Everyone knows of individuals who are exceptionally talented at working up the chain, and lousy when it comes to their own subordinates. Of course, those individuals are much easier to spot when one is a peer or subordinate, vice the supervisor who's getting the great

treatment.  In this case, network mapping would graphically illustrate the connections this person would have going up the chain, and the unexpected dearth of connections to subordinates.

**Identify hierarchies that are being overrun by informal networks**:  If a formal hierarchy has been consumed and overcome by informal networks, this condition will be readily apparent by examining the pattern of connections between the assigned leadership and their subordinates.  For example, if the formal leadership is minimally connected to their subordinates while the connections between their subordinates are unusually strong, it is quite probable that their immediate leadership is no longer actively part of their assigned processes.  Further, the cutting out of a particular level of leadership would be readily apparent if strong relationships appear between subordinates and the leadership two levels up the chain while there are minimal ties between that set of subordinates and their immediate supervisor.

**Identify connectivity (or lack thereof) between flights/squadrons/ divisions**:  Beyond the inner-workings of an individual squadron, network mapping can illustrate the communication lines between squadrons.  This information can be extremely helpful to the group or wing commander:  How often are maintenance and operations consulting each other?   How integrated is the mission support squadron or services squadron with the other squadrons they support?  Are healthy lines of communication established between the medical squadrons and the rest of the base?  Similarly, network mapping could be used to illustrate relationships—or the lack thereof—between offices or divisions on a staff.

**Design/allocate work space to encourage desired communication**:  To increase desired communication between work sections after noting a lack thereof via the informal network map, one might decide to relocate sections as appropriate.  Further, the design of the work space itself,

from office furniture selection to the placement thereof, can facilitate desired information exchange.

**Benefits**

The discretionary use by commanders (squadron, group, or wing level) of a 6-10 question web-based survey to gain a view into the informal networks in their organizations would require almost negligible effort from individual unit members. For this minimal investment of time, however, the commanders would gain an unprecedented view into the workings of their organizations, and could thereby better focus their management and leadership efforts to improve unit communication, personnel recognition, morale, and overall effectiveness.

In addition to the potential applications already discussed, the identification of the individuals filling different critical informational nodes (gatekeeper, hub, and pulse-taker) could be taken into account in a pragmatic and deliberate way when planning personnel moves. This would prevent inadvertently isolating an already tenuously connected part of the organization (by moving a solitary gatekeeper) as well as provide the potential to initiate moves which leverage a person's connections/personality to improve communications between two different sections of an organization, as needed.

**Cautions**

If misused as a stand-alone information provider or taken as gospel, network mapping tools could lead to disastrous results. For example, deciding to recognize or reward personnel based solely on their number of hub connections could result in the recognition of an individual who is great on the grapevine but maybe not too productive beyond information sharing.

Likewise, deciding to discipline or not recommend for promotion a supervisor who didn't show the expected subordinate links would not only obviate an opportunity to help that supervisor improve his performance; the resultant frustration, mortification, resentment and worse could further compound the relatively basic problem of an ineffective supervisor.

Network mapping should, however, provide previously hidden data points a leader could use as a jumping off point to further evaluate his organization and the interaction of the members therein. This information should be protected for sole use by the commander, similarly to the protection of data emanating from the annual USAF Chief of Staff survey.

### Compatibility/Connection with Other Survey Tools

Gathering data through surveys is not a new concept to the Air Force. The most prominent example is the annual chief of staff survey, which is distributed on the world wide web and then tallied at varying levels, from across the Air Force as a single entity, through wings and groups and all the way down to individual squadron level. While this particular survey cannot by its very nature provide all the answers as to why people hold specific opinions, it does provide a picture of the current morale climate which in turn can serve as a launching point for more specific discussions leading to tailored, by-location/unit improvements. The Air Force also utilizes a squadron-level environmental assessment survey on a bi-annual (or commander-requested) basis to collect viewpoints from squadron members on equity of treatment as well as the perceived effectiveness of the unit's leadership. Other surveys are also occasionally issued through other channels, such as surveys specific to health care and morale, recreation, and welfare opportunities. These often target a randomly selected population and arrive through the

US mail system, with the objective of gathering information that will lead to the improvement of services provided to Air Force members.

**Tools that Don't Require Surveys or Algorithms**

Even if one doesn't want to use the tool of mapping the informal networks in one's organization, simply the recognition that such networks exist and can be positively leveraged is an insight a commander can use to the organization's advantage. One can also work to modify a network's propensity to be homogeneous vice heterogeneous by providing somewhat structured opportunities for network growth—across an organization as well as across racial, gender, and religious lines. The concepts that follow are not new, and intuitively their worth has been felt perhaps since the military has been in existence. Now, however, we have science backing us up with empirical data to prove their value....

Beer calls (or Perrier calls, if concerns about alcohol consumption override), burger burns, and break rooms can all be used to build networks within an organization. By providing opportunities for those who work together to play together—whether within a flight, squadron, or wing—informal networks can be built and strengthened which can then be used as resources for expertise, information, and support. While networks will naturally spring up to some degree on their own, the value of providing these opportunities is that they foster connections beyond the typically homogeneously-inclined groupings. Interestingly, such networking opportunities can also strengthen the relative influence of the formal hierarchy, if the leadership makes time to participate in such gatherings on a regular basis. Paperwork gets delayed, it is true, but loyalty is increased both ways as the leader gets to know his troops better, and those same troops understand they have top-cover concern and interest.

As an adjunct, unit ownership of a "dog machine"[11] or something like it, can provide resources with which to support said gatherings. While I'm not advocating that we become like parts of the Chinese Army, more concerned with farming than defending, a reasonable amount of discretionary funds is essential to support events used to bring unit members together. If such funds can be acquired by selling soft ice cream to pilots, then morale and teamwork are heightened all the more (a win-win for both the seller and the purchaser!).

**Conclusion**

Network mapping is a new tool that can be used to great advantage by commanders and leaders at all levels to provide subtle insights into their organizations as well as their personnel, which can then be used to make more informed leadership and management decisions. If this tool is to be used, however, it should be a complete effort with proper training, software, and follow-up. Further, this should be an optional tool, not a mandate, and the information obtained therefrom should be safeguarded.

Even without the formal application of network mapping, commanders can leverage their knowledge of the existence of informal networks by providing opportunities to build non-homogeneous networks as well as increase the personal credibility of the hierarchical leadership. This, in turn, will improve the communication flow, work flow, mentoring opportunities, morale, and ultimately mission effectiveness of their units. We'll know we've achieved a level of success when airmen being surveyed cite unit leadership as a reason for staying, vice departing, the Service.

**Notes**

1.  Department of the Air Force, *Report on Career Decisions in the Air Force:  Results of the 2000 USAF Careers and New Directions Surveys* (Air Force Personnel Center, Survey Branch, 30 November 2000), 40.

2.  Henry Mason, *Quality Flight-Line Maintenance:  A Prescription for the 1990s* (Air University Press, Maxwell AFB, AL, April 1990), 11.

3.  Quoted in Henry Mason, *Quality Flight-Line Maintenance:  A Prescription for the 1990s* (Air University Press, Maxwell AFB, AL, April 1990), 9.

4.  John Scott, "Notes on the History of Social Network Analysis," n.p., on-line, Internet, 24 February 02, available from http://www.analytictech.com/networks/history.htm.

5.  Ibid.

6.  Ibid.

7.  Lin Freeman, "The Study of Social Networks," n.p., on-line, Internet, 27 February 02, available from http://www.heinz.cmu.edu/project/INSNA/na_inf.html.

8. Valdis Krebs, "An Introduction to Social Network Analysis," n.p., on-line, Internet, 14 February 02, available from http://www.orgnet.com/sna.html

9. Karen Stephenson, "Network Management," n.p., on-line, Internet, 24 February 02, available from http://www.netform.com/html/takk.

10. Karen Stephenson, NetForm, interviewed by author, 9 February 02.

11. "Dog Machine" is US Navy jargon for a soft ice-cream machine.